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(54) Title of the Invention: Light Beam Gun Shooting Game Apparatus

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Specification

1. Title of Invention

Light Beam Gun Shooting Game Apparatus

2. Claims

(1) A light beam gun shooting game apparatus having a game controller comprising a central processing unit (hereinafter called CPU), a programmable ROM (hereinafter called PROM) and RAM for supporting the operation of said CPU, and a screen RAM wherewith image signals are written and read out in accordance with commands from said CPU, wherein prescribed video signals are formed according to a predetermined program, and a desired image containing a target is shown on a display device, while a target in said image is shot at using a light beam gun, wherein:

the configuring elements cited below in (a) to (f) are comprised, namely:

(a) a console,

(b) a video display device provided in said console,

(c) a light beam gun attached to said console, oriented relative to [said] video display device, such that the angle of elevation and azimuth angle can be freely changed,

(d) a potentiometer attached to said light beam gun, for detecting the angle of elevation and azimuth angle of [said] light beam gun,

(e) an analog/digital converter for converting the output of said potentiometer to a digital signal, and

(f) a judgment circuit for comparing the address of a target in one frame with the output of said analog/digital converter, every time the trigger of said light beam gun is pulled, and outputting an on-target signal when the target address and the shooting direction coincide.

(2) The light beam gun shooting game apparatus according to claim 1, wherein said light beam gun is provided in a plurality.

3. Detailed Description of Invention

(Industrial Field of Use)

This invention relates to improvements in a light beam gun shooting game apparatus.

(Prior Art)

Light beam gun shooting game apparatuses wherein prescribed video signals are formed according to a predetermined program, and a desired image containing a target is shown on a display device, while the target in the image is shot at using a light beam gun, are publicly known.

According to the configuration of a conventional publicly known light beam gun shooting game apparatus, a light beam gun is supported in a gun holding device so that the angle of elevation and the azimuth angle of the light beam gun can be freely changed,

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and a lens and light receiving element are provided inside the gun barrel. When a player takes aim at a target in an image containing a target shown on a display device, and pulls the trigger of the light beam gun, the video signal for one frame only of the display device changes to a monochrome constant-level signal. When, during that time, the above-described light receiving element detects the image of a spot that scans the screen, the strike point is known by the address corresponding thereto, and, by comparing that with the address of a target existing on a normal game screen, either a hit or a miss is judged.

As a consequence, with a conventionally known light beam gun shooting game apparatus, the screen flickers because, every time the trigger of the light beam gun is pulled, the screen is made a monochrome screen for one frame only. That tendency is particularly conspicuous when the game is played by a plurality of players, and this has been a problem in terms of destroying player interest in the game.

(Problems Invention Would Resolve)

An object of the present invention, which was devised in order to resolve the problems described above, is to provide a new light beam gun shooting game apparatus configured such that hits and misses can be judged accurately, without making the screen a monochrome screen for one frame only when judging hits and misses, such that the flickering that appears on the display screen can be eliminated, and such that players can become completely absorbed in the game.

(Means for Resolving Problems)

The above-described object is attained by a light beam gun shooting game apparatus configured so that the direction of the gun barrel when shooting is measured by a potentiometer, the address of a screen RAM corresponding to the strike point on the screen is calculated, that is compared with the address of the target, and hits and misses are judged.

(Operation)

In the present invention, as described in the foregoing, when the trigger of the light beam gun is pulled, the position of a target in one frame of the screen and the position of the muzzle in the one frame of the screen calculated from the angle of elevation and azimuth angle of the light beam gun directed toward the above-described screen are compared, and thereby a hit or miss is judged. Therefore, it is possible to eliminate flickering on the display screen that appears every time the trigger of the light beam gun is pulled, as [occurs] with a conventional light beam gun shooting game apparatus, and to further increase player interest in the game.

(Embodiments)

The details of the present invention are now described concretely using the drawings.

Fig. 1 is an external view of one embodiment of a light beam gun shooting game apparatus related to the present invention, Fig. 2 is an external view showing the configuration of the light beam gun thereof, Fig. 3 is a partially cutaway explanatory diagram showing the internal mechanism of the light beam gun, Fig. 4 is a partially

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cutaway view showing the internal mechanism of a gun holding apparatus, and Fig. 5 is a block diagram of the circuit configuration of the light beam gun shooting game apparatus related to the present invention.

In Fig. 1 to 4, item 1 is a light beam gun shooting game apparatus, 2 a console, 3 a video display screen, 4 a light beam gun, 4a the muzzle of the above-described light beam gun, 4b the trigger of the above-described light beam gun, 5 a money insertion slot, 6 a game start switch, 7 a money collection door, 8 an arm, 9 a gun master, 10 solenoid coil, 11 a microswitch, 12 a return spring, 13 a plunger, 14 a movable base, 15 a sub-base, 16 a first gear that turns together with the above-described movable base 14, 17 a second gear that turns in accordance with the arm 8, 18 a potentiometer for measuring azimuth angles, 19 a potentiometer for measuring angles of elevation, and 20 a turning-center shaft.

In Fig. 5, furthermore, where the numbers that are the same as those used in Fig. 1 to 4 indicate the same configuring elements, item 21 is an I/O port, 22 a PROM, 23 a CPU, 24 a RAM, 25 and 26 analog/digital converters, 27 an audio generator circuit, 28 a speaker, 29 a timing pulse generator, 30 a screen RAM, 31 a judgment circuit, and 32 a video signal generator circuit.

Descriptions pertaining to Fig. 1 to 4 are given first.

The light beam gun shooting game apparatus 1 relating to the present invention has provided, in the console 2, the video display screen 3 and two light beam guns 4 and 4 relatively oriented to the above-described video display screen 3.

The arm 8, which supports the light beam gun 4, is configured so as to be able to turn about a vertical center shaft on the movable base 14 together with the movable base 14, and so as to be able to tilt within a certain angle about the turning-center shaft 20 of the second gear 17.

Accordingly, the light beam gun 4 is configured so that the angle of elevation and azimuth angle can be changed to desired angles, but also so that, when the angle of elevation and azimuth angle reach certain angles, further movement is limited by the action of a moving range stopper case (not shown).

The configuration is further made so that, when the azimuth angle of the light beam gun 4 changes, the movable base 14 turns about the center shaft thereof, the potentiometer 18 for measuring the azimuth angle is turned by the first gear 16, and, when the angle of elevation of the light beam gun 4 is changed, the potentiometer 19 for measuring the angle of elevation is turned by the second gear 17 that turns together with the arm 8. Provision is [thus] made so that the direction of the light beam gun 4 can be known by the outputs from the above-described potentiometer 18 for measuring the azimuth angle and potentiometer 19 for measuring the angle of elevation.

Thereupon, when the aim is fixed on a target, and the trigger 4b of the above-described light beam gun 4 is pulled, a current is applied [sic] to the solenoid coil 10, the above-described solenoid coil 10 moves the plunger 13 forward and backward, in the direction of the gun barrel, against the elastic force of the return spring 12, thereby causing a vibration shaft (not shown) that is connected to the above-described plunger 13

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to strike the chassis, whereby a [mechanical] shock is imparted to the light beam gun 4, giving the player the sensation of firing a gun.

A description pertaining to Fig. 5 is given next.

The I/O port 21 receives input signals from a publicly known money depositing apparatus and from the game start switch 6, etc., encodes those signals and sends them to the CPU 23, etc., and also receives signals from the above-described CPU 23 and controls the functions of the above-described input/output devices.

In the PROM 22 are stored the program and object patterns and the like necessary for the game. As necessary, these data are supplied to the CPU 23.

The CPU 23, responding to inputs from the I/O port 21, sends necessary command signals to the audio generator circuit 27, screen RAM 30, and judgment circuit 31. In the screen RAM 30 are stored a one-screen volume of image data for displaying background and targets and the like on the video screen.

The audio generator circuit 27, responding to signals from the CPU 23, generates prescribed audio signals according to the progress of the game, drives the speaker 28, and produces sound effects and the like.

When the trigger 4b of the light beam gun 4 is pulled, azimuth angle and angle of elevation detection signals for the above-described light beam gun 4 are output by the potentiometer 18 for measuring azimuth angles and the potentiometer 19 for measuring angles of elevation. Those detection signals, after being converted to digital signals by the analog/digital converters 25 and 26, are input to the judgment circuit 31. Those digital signals correspond to addresses in the screen RAM 30 which correspond with the direction of the light beam gun 4, that is, with the strike point.

The judgment circuit 31 compares the outputs of the above-described analog/digital converters 25 and 26 with the address of the target and, when those coincide, outputs an on-target signal to the CPU 23.

Thereupon, when an on-target signal is issued, image data representing a destroyed target are written to the screen RAM 30 by a signal from the CPU 23, and the image of the destroyed target is shown on the video display screen 3.

(Effectiveness of Invention)

Because the present invention is configured as described in the foregoing, when based on the present invention, when the trigger of a light beam gun is pulled, hits or misses are judged by comparing the address of the target in one frame of the screen, and the address of a strike point on the screen calculated on the basis of the angle of elevation and azimuth angle of the light beam gun oriented toward the above-described screen. Therefore, [the light beam gun shooting game apparatus relating to the present invention] is one wherewith flickering that appears on the display screen every time the trigger of the light beam gun is pulled, as occurs with a conventional apparatus, can be eliminated, and players can become completely absorbed in the game.

Furthermore, the present invention is not limited to or by the embodiment described in the foregoing. More specifically, for example, although in this embodiment an upright type shooting game is assumed, [the present invention] can be applied to other

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types, such as similar games like aerial combat games, for example. The present invention comprehends all modified embodiments that could be arrived at easily, from the above-described embodiment, by one skilled in the art.

4. Brief Description of Drawings

Fig. 1 is an external view of one embodiment of a light beam gun shooting game apparatus related to the present invention, Fig. 2 is an external view showing the configuration of the light beam gun thereof, Fig. 3 is a partially cutaway explanatory diagram showing the internal mechanism of the light beam gun, Fig. 4 is a partially cutaway view showing the internal mechanism of a gun holding apparatus, and Fig. 5 is a block diagram of the circuit configuration of the light beam gun shooting game apparatus related to the present invention.

1	light beam gun shooting game apparatus
2	console
3	video display screen
4	ight beam gun
4a	muzzle
4b	trigger
5	money insertion slot
6	game start switch
7	money collection door
8	arm
10	solenoid coil
12	return spring
13	plunger
14	movable base
15	sub-base
16	first gear
17	second gear
18	potentiometer for measuring azimuth angles
19	potentiometer for measuring angles of elevation
21	I/O port
22	PROM
23	CPU
24	RAM
25, 26	analog/digital converters

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27 audio generator circuit
28 speaker
29 timing pulse generator
30 screen RAM
31 judgment circuit
32 video signal generator circuit

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1 light beam gun shooting game apparatus
2 console
3 video display screen
4 ight beam gun
4a muzzle
4b trigger
5 money insertion slot
6 game start switch

Figure 1

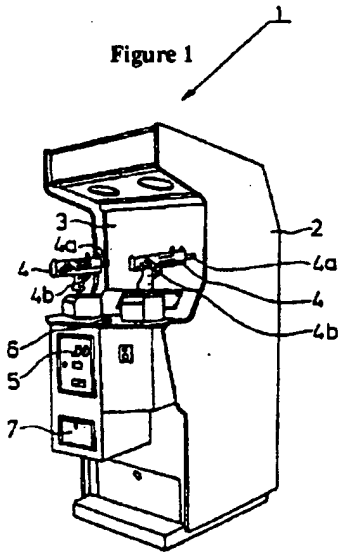


Figure 2

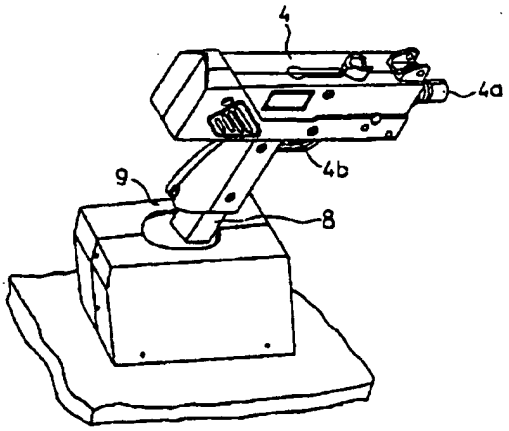


Figure 3

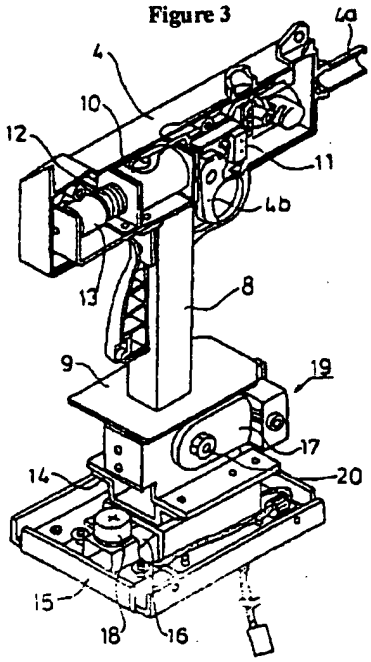
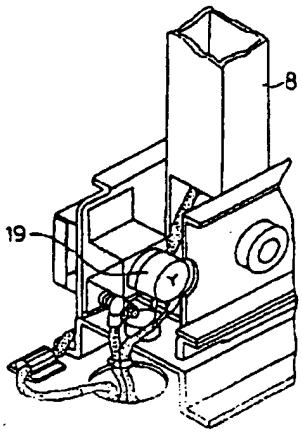
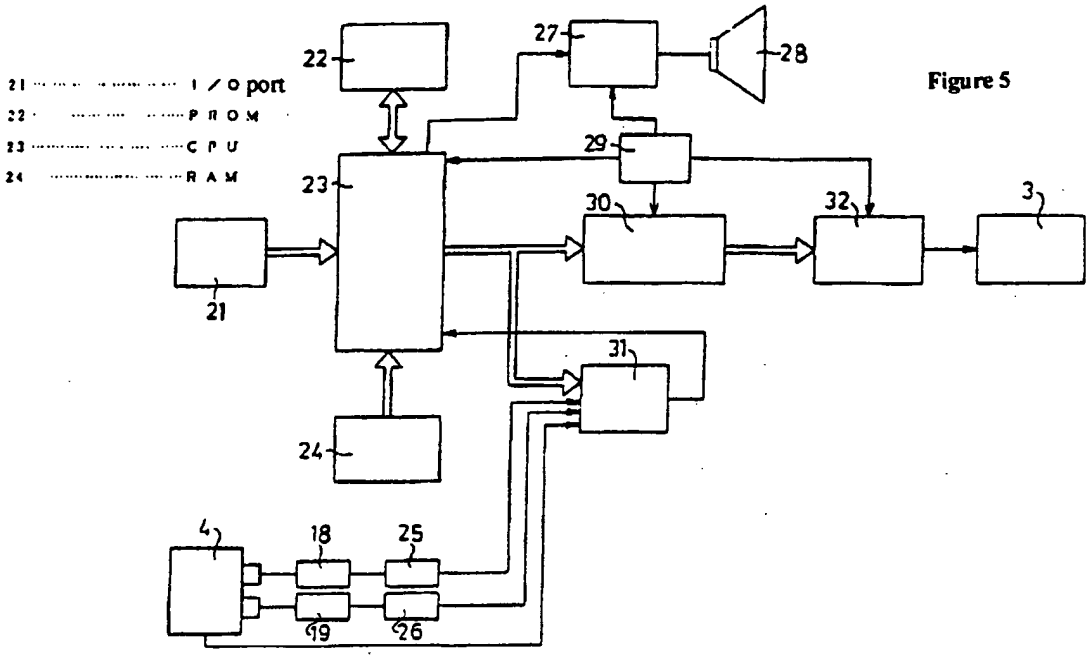


Figure 4




21 ..... I / O port
22 ..... P R O M
23 ..... C P U
24 ..... R A M
22
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24
4
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Figure 5